Appendix B

Evaluating the Functional Form of the Purity Models

The econometric models used in this report are highly parameterized, with many random slope coefficients (which in essence represent city-specific slope coefficients). Given the erratic way in which the data are collected and the fact that some models for specific quantity levels are based on a relatively small number of observations, we wanted to assess the goodness of fit of these highly parameterized models. To do so, we compared our most complex version of these models to two simpler forms. The simplest version of the purity model is one that allows only for a random intercept (or individual city-specific effect). The next version of the model additionally allows the relationship between purity and amount of the drug to vary across cities. These simpler models are both nested within our complex version of the purity model, which also allows for unique time effects on purity across cities. Given that the models are all nested within our primary model, we can compare the appropriateness of each, using the Akaike Information Criterion (AIC). A smaller AIC value is indicative of a better-fitting model. AIC statistics for each of the price models are presented in Table B.1.

Table B.1. Akaike Information Criterion Test Statistics Evaluating Goodness of Fit of Alternative Models for the Purity Equation

Quantity Level	Column A Random intercept (no random slopes on amount or time)	Column B Random intercepts and random slope on amount only	Column C Primary Model: Random intercept and random slopes on amount and time
Powder Cocaine			
1	-812.3	-811.7	**-1,198.6**
2	-1,642.3	-1,643.1	**-1,791.2**
3	-6,957.1	-6,956.2	**-7,641.4**
4	-5,323.0	-5,442.6[a]	**-5,729.2**
Crack Cocaine			
1	-11,247.4	-11,247.4	**-11,580.0**
2	-14,767.4	-14,786.5	**-15,599.7**
3	-12,151.1	-12,187.0	**-12,763.4**
Heroin			
1	-5,022.6	-5,172.5	**-6622.4**
2	-1,178.1	-1,340.4	**-2223.9**
3	113.5	102.2	**-303.9**
d-Methamphetamine			
1	986.6	983.7	**773.7**
2	638.6	611.7	**403.9**
3	-491.5	-490.1	**-553.9**

[a] The model did not fully converge but still produced estimates.

The results in Column C represent the AIC value for the primary model presented in the report. We indicate in bold the specification of the model with the smallest AIC value. In each model, the AIC test for the primary model (Column C) is smaller than that for the simpler models. This suggests that the additional parameterization improves the performance of the purity model.

Table B.2 shows the covariance parameter estimates from the primary purity models for the time and amount variables. While most of the purity models did not have enough variation across cities in the relationship between purity and amount to produce random effects across cities, a few did have significant variation in this relationship. Furthermore, the time effects had statistically significant variation across cities in all models. This offers further support for the improvement of using the primary model in this report rather than the simpler models. In the next appendix, we perform a similar analysis for the price models.

Table B.2. Covariance Estimates Generated for the Purity Equation from Our Primary Model, Including Random Slope Coefficients

	Covariance Parameter Estimate for Purity & Time				Covariance Parameter Estimate for Purity & Amount			
Model	**Estimate**	**Std Error**	**Z-Value**	**Prob Z**	**Estimate**	**Std Error**	**Z-Value**	**Prob Z**
Powder								
Quantity Level 1	0.0089	0.0009	10.47	<.0001	1.960E-04	2.980E-04	0.66	0.2551
Quantity Level 2	0.0047	0.0005	8.65	<.0001	1.200E-05	1.300E-05	0.91	0.182
Quantity Level 3	0.0048	0.0003	15.47	<.0001	2.164E-07	0	.	.
Quantity Level 4	0.0039	0.0003	11.04	<.0001	1.664E-09	0	.	.
Crack								
Quantity Level 1	0.0033	0.0004	9.01	<.0001	0	.	.	.
Quantity Level 2	0.0032	0.0003	12.49	<.0001	3.198E-06	1.769E-06	1.81	0.0353
Quantity Level 3	0.0040	0.0003	12.13	<.0001	2.793E-08	0	.	.
Heroin								
Quantity Level 1	0.0123	0.0007	17.07	<.0001	7.897E-03	2.668E-03	2.96	0.0015
Quantity Level 2	0.0174	0.0011	15.8	<.0001	1.690E-04	5.300E-05	3.18	0.0007
Quantity Level 3	0.0126	0.0011	11.89	<.0001	2.156E-08	0	.	.
D-Methamphetamine								
Quantity Level 1	0.0152	0.0019	8.12	<.0001	5.700E-05	5.700E-05	1	0.158
Quantity Level 2	0.0101	0.0012	8.29	<.0001	1.234E-06	0	.	.
Quantity Level 3	0.0033	0.0008	4.44	<.0001	0	.	.	.